

# PATENT SPECIFICATION

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 (72) Inventors REGINALD HAROLD EATON and  
 JAMES SHARRATT



## (54) IMPROVEMENTS IN OR RELATING TO WATER PURIFICATION APPARATUS

- (71) We, ELGA PRODUCTS LIMITED, a British Company, of Lane End, Buckinghamshire HP14 3JH, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- This invention relates to the purification of water and has particular application to water purification apparatus having a cartridge mounted in a base.
- A conventional water purification apparatus comprises a cartridge containing exchange resins and a base for supporting the cartridge. The base has a conduit through which water to be purified is fed to an inlet to the cartridge. Water is purified as it passes through the exchange resins in the cartridge. This type of apparatus has the disadvantage that when the cartridge is removed from the base water tends to drip from the cartridge.
- The present invention provides a water purification apparatus comprising a cartridge containing exchange resins through which water to be purified is passed, and a support base for said cartridge, the cartridge and base each having a valve through which the water is arranged to pass into said cartridge, said valves being closable automatically when the cartridge is removed from the base.
- According to the present invention there is provided a water purification apparatus comprising a cartridge adapted to contain exchange resins for purifying water, a base for supporting the cartridge in a substantially upright position, said base having a conduit through which water to be purified can flow to an outlet, said cartridge having an inlet which, when the cartridge is mounted in the base, is arranged to communicate with said base outlet, a valve disposed in each of said base outlet and said cartridge inlet, means for opening said valves when said cartridge is mounted in said base, the valves being closable automatically when the cartridge is removed from the base.
- The cartridge may be a cylinder.
- Each valve may have a valve member with a portion which projects axially beyond the valve housing, the valve in the base and the valve in the cartridge being arranged so that when the cartridge is mounted in said base, the projecting portions engage to urge the valve members away from their seats to open the valves. Each valve may have a bias spring tending to urge the valve member of the valve to its closed position.
- The cartridge may have an outlet through which water can leave and the base then has a further conduit which is arranged to communicate with the cartridge outlet when the cartridge is mounted in the base, said cartridge outlet and the inlet to the further conduit each having a valve which is arranged to open when the cartridge is mounted in the base and to close when the cartridge is removed from the base.
- Preferably the valve in the cartridge outlet and the valve in further conduit inlet each have a valve member with a portion which projects axially beyond the valve housing, the valve in the further conduit and the valve in cartridge outlet being so disposed that when the cartridge is mounted in the base, the projecting portions engage to urge the valve members away from their seats to open the valves.
- The base may have a retaining mechanism for retaining the cartridge in the base. The retaining mechanism may comprise a pair of arms pivotably mounted on said base so that they can engage a groove in the said cartridge at substantially diametrically opposite positions, bias means urging said arms towards each other and means for moving said arms away from each other against the bias means to release said cartridge.
- The bias means may be a spring.
- The moving means may comprise a manually operable member having a planar

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portion which is normally disposed so that its narrow dimension separates the free ends of said arms, said manually operable member being rotatable so that the free ends are separated by a wider dimension of the planar portion thereby moving the arms away from each other.

The base may have a cartridge ejection device for ejecting the cartridge from the base when said retaining mechanism has been moved to its release position. The cartridge ejection device may comprise a pin mounted below said cartridge so as to be movable vertically, a pivotal lever one end of which is in engagement with said pin, and means engaging the other end of said lever, said engaging means being operable to pivot said lever to force said pin upwardly to contact the base of said cartridge. The engaging means may be said manually operable member which is movable axially after being rotated to its release position.

The invention will be described now by way of example only with particular reference to the accompanying drawings. In the drawings:

Figure 1 is a side elevation of a water purification apparatus in accordance with the present invention;

Figure 2 is a plan view of the base part of the apparatus of Figure 1;

Figure 3 is a section on the line 3—3 of Figure 2;

Figure 4 is a section on the line 4—4 of Figure 3;

Figure 5 is a section similar to Figure 4 showing the release knob in a different position;

Figure 6 is a section on the line 6—6 of Figure 5;

Figure 7 is a plan view from beneath of the base part of the apparatus of Figure 1;

Figure 8 is a section on the line 8—8 of Figure 1, and

Figure 9 is a section on the line 9—9 of Figure 2.

The apparatus shown in the drawings consists of a water purification cartridge in the form of a cylinder 10 which is mounted in a base 11. The cylinder 10 contains cation and anion exchange resins. Water to be purified is passed through the resins in the cylinder and is purified by a known process which will not be described in the present specification.

The cylinder 10 comprises an upstanding tubular body 12 which is closed at its upper end by an end cap 14 and at its lower end by a similar end cap 15 shown partially in Figure 9.

The upper end cap 14 has an axially extending bore which is closed by a valve assembly 21. The valve assembly 21 will be described in more detail below.

The lower end cap has two axially

extending bores one of which is shown in Figure 9 and is defined by an annular wall 28. The two axially extending bores are disposed on a diameter of the end cap so as to be equally spaced from the centre of the cap. One bore constitutes an inlet for water into the cylinder and the other bore which is defined by the wall 28 and is in communication with a pipe 30 extending vertically into the cylinder constitutes an outlet for water leaving the cylinder after it has been treated. The inner end of the inlet bore (not shown) is covered by a screen filter through which water passes as it issues into the cylinder 10. The inlet and outlet bores each accommodate a valve which is similar to the valve 21. One such valve 34 is shown in Figure 9 and the construction of these two valves will be described in detail later. Similar valves are carried by the base member 11 at positions indicated at 37, 38 in Figure 2. The position of the valves 37, 38 in the base corresponds to the position of the valves in the base of the cylinder 11. This is illustrated in Figure 9 for the valves 34 and 38. The arrangement is such that when the cylinder 10 is mounted in the base 11, the valves in the base of the cylinder 10 and the valves 37, 38 are open whilst when the cylinder is removed from the base 11 all these valves are closed.

The base 11 comprises a generally square moulded housing with vertical side walls 40 to 43. The walls support a top 44 which has a central circular recess 45 the diameter of which corresponds substantially to the diameter of the cylinder 10. The base of the recess 45 has a central relatively small aperture 51 and two larger diameter apertures one on each side of the small aperture 51. The larger apertures accommodate the valves 37, 38 which are so disposed that they project above the base of the recess 45 (see Figure 3). A downwardly depending annular flange 56 is formed around the aperture 51 and downwardly depending annular flanges 57 (one shown in Figure 9) are formed around the larger apertures. The flanges 57 have inwardly directing lips 60 at their lower end portions. The lips 60 support the valves in the respective apertures as shown in Figure 9 for the valve 38. At diametrically opposite positions the side wall of the recess 45 has two cut-out portions which are shown at 63 and 64, these cut-out portions lying on a diameter which passes through the centre of the aperture 51 and the centre of the valves 37, 38.

At a position at the end of a diameter perpendicular to the diameter through the valves 37, 38 the outer surface wall of the recess 45 joins an outwardly extending top surface 66. The surface 66 has a generally circular aperture 68 which is defined by a

- downwardly extending annular flange 69 (Figures 4 and 5). A 90° arcuate portion 70 of the wall of the flange 69 is cut away adjacent its upper edge to define an arcuate step 71. At one end of the step 71 a slot 72 is formed in the wall of the flange 69, the slot 72 extending downwardly from the surface of the step 71.
- The aperture 68 accommodates an upwardly extending, generally cylindrical knob 80 of a cylinder release member. The knob 80 projects upwardly through the aperture 68. The knob 80 has a radially projecting rib 83 which extends longitudinally downwardly from the top of the knob. In the position shown in Figures 2, 3 and 4 the base of the rib 83 sits on the step 71. If the knob 80 is rotated clockwise through 90° from the position shown in Figure 2, the rib is aligned with the slot 72. The knob can then be pressed downwardly so that the rib 83 moves into the slot 72 as shown in Figure 5. The knob 80 is connected at its lower end to a planar portion 84 which extends downwardly from the knob and carries at its lower end a generally cylindrical part 85. The planar portion 84 and the cylindrical part 85 form part of the cylinder release member and can be moved vertically downwardly a distance corresponding to the depth of the slot 72 when the knob 80 is rotated 90° from its position shown in Figure 2.
- The cylindrical part 85 is connected by a screw 88 to one end of a lever 90. The lever 90 has two spaced parallel arms 91, 92 (Figure 7) which are bridged substantially midway between their ends by a transversely extending rib 93. The rib 93 is supported on two hook shaped portions 94, 95 which extend downwardly from the base of the recess 45 to pivotally mount the lever 90. The other end of the lever is shaped to define a recess 100, the recess 100 accommodating a correspondingly shaped lower portion 102 of a pin 103 which extends upwardly into the aperture 51 and is normally positioned so as to be substantially flush with the surface of the recess 45. The lever 90 can be pivoted by pressing downwardly on the knob 80 thereby causing the recessed end of the lever to rise and push the pin 103 upwardly so that it projects above the base of the recess 45.
- A cylinder retaining means is formed from two members 110, 111. Each member 110, 111 comprises a leg portion 112, 114 which is pivotally mounted on pins 115, 116 which depend downwardly from the lower surface of the top 44 near the wall 41; and an inwardly directed foot portion 118, 119 which terminates adjacent the planar portion 84 of the cylinder release member. Each leg portion 112, 114 extends alongside the wall of the recess 45 and has a projection 120, 121 which normally projects through a respective cut-out part 63, 64 in the wall of the recess. The feet portions 118, 119 are linked by a spring 124 which urges the members 110, 111 toward each other. When the cylinder 10 is mounted in the base 11 the projections 120, 121 engage a groove 125 (Figure 9) in the cylinder 10 to retain the cylinder in the base.
- A meter housing portion 130 is attached to the front wall 43 of the base part 11. This housing portion accommodates a meter 132 which is arranged to provide an indication of the quality of the water flowing through the cylinder 10.
- Conduits 134 and 135 extend from the apertures containing the valves 37, 38. The conduits 134, 135 extend upwardly alongside the wall 41 and terminate at opposite ends of the wall 41 in screw connectors 136, 137. The screw connectors allow suitable tubing to be connected to the base to allow water to be conveyed to and from the cylinder 10.
- A detail of the valve 21 is shown in Figure 8. The valve has a tubular housing 140 which is sealed within a recess in the end cap 14. The housing 140 has a first end face 141 which has four openings 142 formed therein and carries an integrally formed, inwardly extending pin 143. The other end face constitutes a valve seat and has a central circular aperture and four further apertures 146 disposed thereabout. A valve member 147 is disposed between the valve seat and the other end face 141 of the valve housing 140. The valve member 147 comprises a circular disc portion 148 with an axially extending cylindrical portion 150 which extends through the central aperture in the valve seat 145 and an oppositely extending tubular portion 152 within which is located a valve spring 153. The valve spring extends between the base of the tubular portion 152 and the end face 141 of the valve housing 140. The spring 153 normally biases the valve member 147 to a position in which it closes the apertures in the valve seat 145. A washer 155 is disposed between the valve seat 145 and the disc portion 148 of the valve member. The valve can be opened by pressing downwardly on the cylindrical portion 150 to move the disc portion 148 and the washer 155 away from the valve seat 146 against the bias of the spring 153. This provides a passage for flow of liquid through the apertures 146 to the apertures 142.
- The valves mounted at the base of the cylinder 10 and those carried by the base 11 are of similar construction to that shown in Figure 8. Two such valves, one in the cylinder and one in the base are shown in Figure 9 and integers corresponding to those of Figure 8 are shown by like reference numerals. The valve 28 shown in

Figure 9 is sealed within the bore defined by the wall 28 in the lower end cap 15. The valve 38 in the base 11 projects upwardly into the bore defined by the wall 28 and is sealed therein by an O-ring seal 160 carried by the housing of the valve 38. In the position shown in Figure 9 the valves 34 and 38 are open, the cylindrical parts 150 having contacted each other when the cylinder was placed in the base to thereby force the valve members away from their seats. Thus, liquid can flow from the pipe 30 through the valve 34, the valve 38 and into the conduit 134.

When the cylinder 10 is not mounted in the base 11, the valve 34, 37 and 38 are all closed. When the cylinder is placed in the base, the downwardly projecting cylindrical parts 150 of the valves in the lower end cap of the cylinder come into engagement with the upwardly projecting parts 150 of the valves 37, 38 in the base so that the valve members of the respective valves are moved away from their valve seats thereby automatically opening the valves. At the same time the projections 120, 121 on the members 110, 111 of the cylinder retaining means clip into the groove 125 at the lower end of the cylinder. The cylinder is thus secured in the base. Water can then be passed through the cylinder 10 via the conduits 134 and 135 and the valves 34, 37 and 38 in order to purify it.

To remove the cylinder 10 from the base 11, the knob 80 is rotated through 90° from its position shown in Figures 2, 3 and 4. This rotation results in the planar part 84 forcing apart the feet of the legs 112, 114 as illustrated in Figure 5. In the position shown in Figure 5 the projections 120, 121 are disengaged from the groove 125 in the cylinder 10. In this position the cylinder can be lifted from the base 11. If necessary, as the cylinder may be a tight fit in the base, the knob 80 can be pressed vertically downwards so that the rib 83 moves into the slot 72. This causes the lever 90 to pivot about its pivotal mounting on the hooks 94, 95 so that the pin 103 is forced upwardly against the base of the cylinder 10 thereby moving it out of the recess in the base. As the cylinder is removed from the base the cylindrical parts 150 of the respective valves move out of contact and the springs 153 of the valves cause the various valve members to move against the valve seat to close the valves. It will thus be appreciated that any liquid in the cylinder 10 cannot run out and cause annoying drips. Similarly water cannot flow out through the valves in the base 11.

#### WHAT WE CLAIM IS:—

1. Water purification apparatus comprising a cartridge adapted to contain ion exchange resins for purifying water, a

base for supporting the cartridge in a substantially upright position, said base having a conduit through which water to be purified can flow to an outlet, said cartridge having an inlet which, when the cartridge is mounted in the base, is arranged to communicate with said base outlet, a valve disposed in each of said base outlet and said cartridge inlet, means for opening said valves when said cartridge is mounted in said base, the valves being closable automatically when the cartridge is removed from the base.

2. Water purification apparatus as claimed in claim 1 wherein said cartridge is a cylinder.

3. A water purification apparatus as claimed in claim 1 or claim 2 wherein each valve has a valve member with a portion which projects axially beyond the valve housing, the valve in the base and the valve in the cartridge being so arranged that when the cartridge is mounted in said base, the projecting portions engage to urge the valve members away from their seats to open the valves.

4. Water purification apparatus as claimed in claim 3 wherein each valve has a spring which acts to urge the valve member of the valve to its closed position.

5. Water purification apparatus as claimed in any preceding claim wherein the cartridge has an outlet through which water can leave and the base has a further conduit which is arranged to communicate with the cartridge outlet when the cartridge is mounted in the base, said cartridge outlet and the inlet to the further conduit each having a valve which is arranged to open when the cartridge is mounted in the base and to close when the cartridge is removed from the base.

6. Water purification apparatus as claimed in claim 5 wherein the valve in the cartridge outlet and the valve in further conduit inlet each have a valve member with a portion which projects axially beyond the valve housing, the valve in the further conduit and the valve in cartridge outlet being so disposed that when the cartridge is mounted in the base, the projecting portions engage to urge the valve members away from their seats to open the valves.

7. Water purification apparatus as claimed in any preceding claim including a releasable retaining mechanism for releasably retaining the cartridge in the base.

8. Water purification apparatus as claimed in claim 7 wherein said retaining mechanism comprises a pair of arms pivotably mounted on said base so that they can engage a groove in the said cartridge at substantially diametrically opposite positions, bias means urging said arms

towards each other and means for moving said arms away from each other against the bias means to release said cartridge.

- 5 9. Water purification apparatus as claimed in claim 8 wherein said bias means is a spring.

- 10 10. Water purification apparatus as claimed in claim 8 or claim 9 wherein said moving means comprises a manually operable member having a planar portion which is normally disposed so that its narrow dimension separates the free ends of said arms, said manually operable member being rotatable so that the free ends are separated by a wider dimension of the planar portion thereby moving the arms away from each other.

- 15 11. Water purification apparatus as claimed in any one of claims 8 to 10 wherein said base has a cartridge ejection device for ejecting the cartridge from the base when said retaining mechanism has been moved to its release position.

- 20 12. Water purification apparatus as claimed in claim 11 wherein said ejection device comprises a pin mounted below said cartridge so as to be movable axially, a pivotal lever one end of which is in engagement with said pin, and means

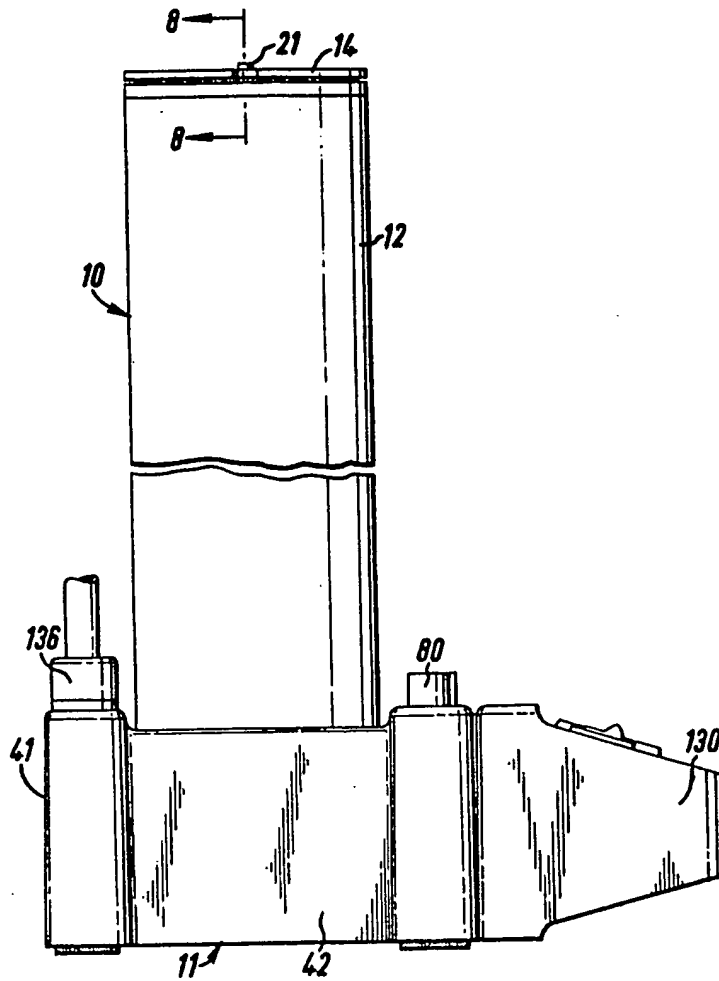
engaging the other end of the lever, said engaging means being operable to pivot said lever to force said pin axially upwardly to contact the base of said cartridge.

- 30 13. Water purification apparatus as claimed in claim 12 wherein said engaging means comprises said manually operable member which is movable axially after being rotated to the release position.

- 35 14. A water purification cartridge for use in the apparatus of claim 1, said cartridge being adapted to contain ion exchange resins for purifying water, said cartridge having an inlet for water to be purified, said inlet having a valve which is arranged to engage a similar valve in a base for supporting the cartridge, the valve being arranged to open automatically upon engagement with the similar valve.

- 40 15. Water purification apparatus substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

For the Applicants:  
F. J. CLEVELAND & COMPANY,  
(Chartered Patent Agents),  
40—43 Chancery Lane,  
London WC2A 1JQ.



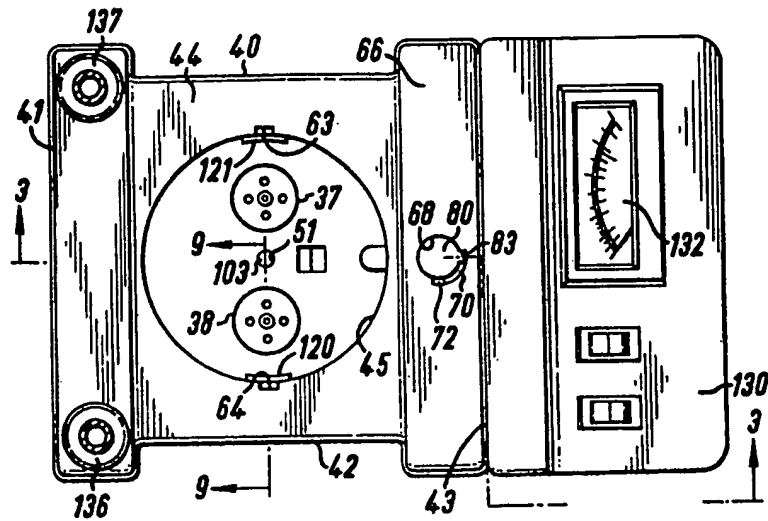


FIG. 2

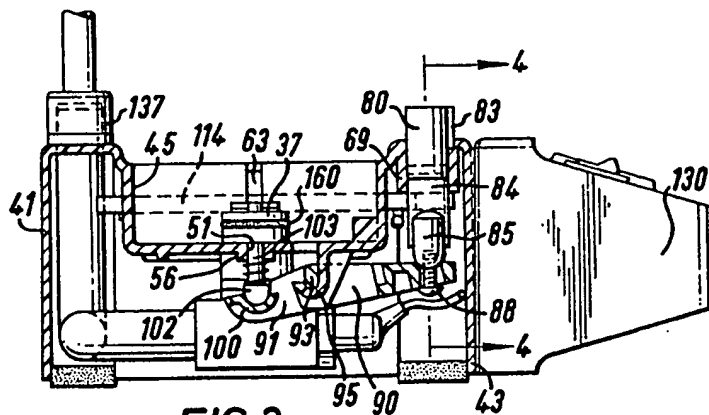


FIG. 3

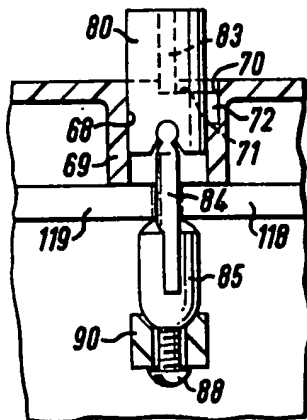


FIG. 4

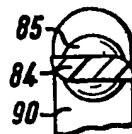


FIG. 6

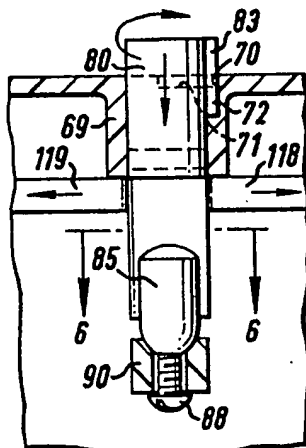
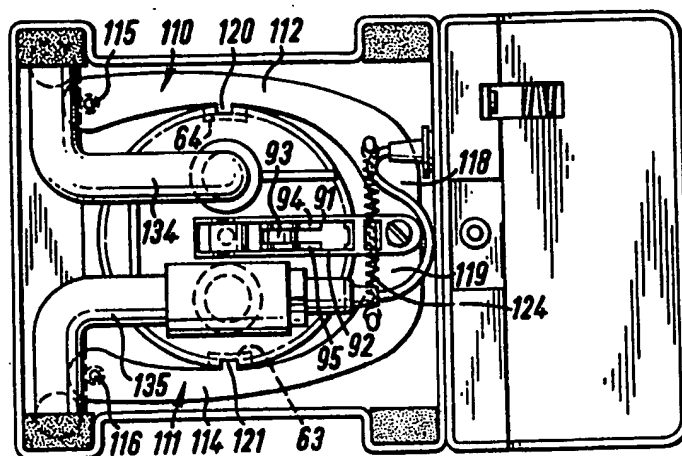
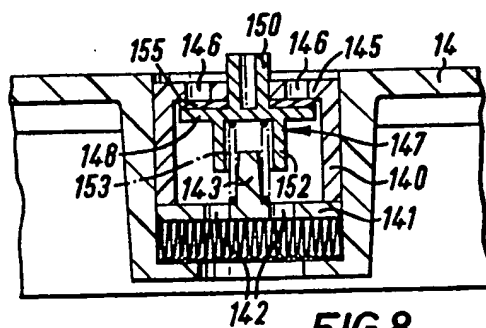


FIG. 5



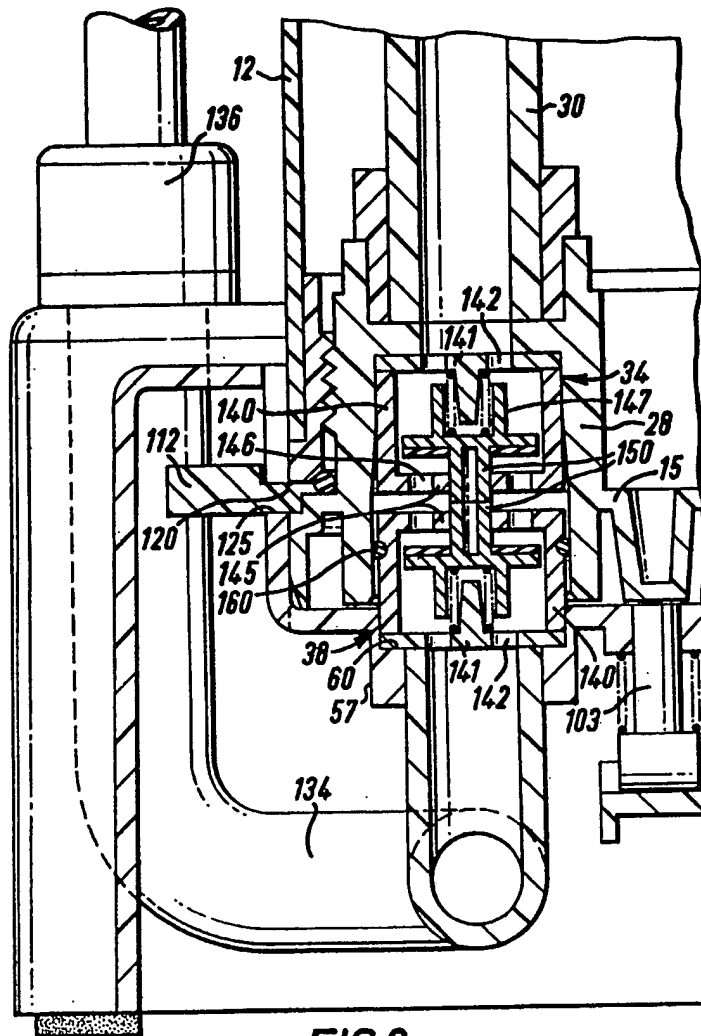


**FIG.7**



**FIG.8**

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**FIG.9**

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